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of

Claes Lindgren

Mark Albert Feucht

Steven Roy Kastner

and

Samuel Howard Darmer

Jeffrey Joseph Ronan

Elizabeth F. Talcott

Birgitte Hansen

Lars Jørn Nissen-Schmidt

Bjørn Dyrby

For

# Skylight With Sealing Gasket

## Titl of th Invention

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## Background

Skylights are popular features in commercial and residential buildings, allowing the illumination of rooms with natural light and thereby reducing the consumption of electricity associated with lighting rooms with electric power. In addition to enhancing interior illumination, skylights increase the perceived interior roominess of a structure to a higher degree than through the use of vertical windows in walls. Openable skylights may also be configured to enhance air circulation through a room.

Skylights are installed in original building construction, but also are installed in existing buildings as improvements.

A skylight may be fitted upon a structure known as a curb that is attached to the roof of the building to which the skylight is installed. The curb may be a rectangular frame made of stock lumber that surrounds an opening in the exterior roof of the building, with flashing disposed around the perimeter of the curb to prevent water intrusion into the building. The skylight, which typically, yet need not always, includes a frame and a transparent or semi-transparent pane, is affixed to the curb.

The opening for a skylight in a building roof may extend through the entirety of the roof thickness, including the interior building ceiling and all structures, such as roof joists, between the exterior roofing surface and the interior ceiling surface. For structural and aesthetic purposes, framing and sheetrocking may be used to form finished sidewalls that extend between the ceiling and the roof.

As a penetration in the exterior building envelope, a skylight assembly needs to be configured to prevent the unwanted intrusion of the elements, such as rain and wind, into the building. Furthermore, a skylight needs to be configured to manage condensed water vapor that may collect on the interior side of the skylight pane, which, if not controlled, may flow to adjacent sheetrock or wood, leading to undesirable discoloration or deterioration of such adjacent materials. It is therefore

the case that a skylight assembly must have a weatherproof seal. Varying combinations of caulk, mastics, glues, and other materials have been employed to provide for such a desired seal. However, such caulk and the like have undesirable characteristics. For instance, once a skylight is installed with use of such materials, removal or adjustment of the position of the unit is hampered in that residue of such materials is left either on the skylight or on the curb assembly. Furthermore, thermal expansion and contraction of the building or of the skylight may decrease the effectiveness of the seal created by such materials. Additionally, use of such materials consumes time during the installation of a skylight and, depending on the degree of skill of the installer, is prone to mistakes.

The present invention provides for an improved sealing assembly for use with a skylight that prevents the unwanted transfer of rain, wind, heat, and the like both to and from the interior surface of a building onto which the skylight is mounted.

## Summary

Various features and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned from practice of the invention.

The present invention provides for a skylight with a sealing gasket. The skylight is mounted to a curb affixed to a building roof, with a sealing gasket disposed between the skylight and the curb. The skylight has a structural frame and an at least semi-transparent pane attached to a frame.

The curb may be constructed of a plurality of members of metal or structural lumber, such members of rectangular or square cross-section. The structural members comprising the curb may be interconnected so as to define a perimeter of varying geometries, typically square or rectangular, about an opening through a building roof. The curb so constructed is affixed to a building roof. So affixed, the curb members provide three surfaces: inner surfaces about the roof opening, opposed outer surfaces, and upper top surfaces disposed between and perpendicular to the inner surfaces and outer surfaces.

The skylight structural frame comprises rigid, typically rectilinear members surrounding the pane, retaining the pane in a desired position relative to the frame

and providing for attachment of the skylight to the curb. The structural frame has an inner side surface that faces and surrounds the outer surfaces of the curb, to define a first gap therebetween. The skylight also has a bottom surface that faces the upper top surfaces of the curb to define a second gap therebetween.

A gasket is disposed between the skylight and the curb. The gasket has a main body portion that contacts both the upper top surface of the curb and the bottom surface of the skylight. The main body portion extends across the second gap. The gasket also has a first arm that extends from the main body portion and across the first gap. The first arm contacts the inner side surface of the skylight.

The present invention also provides for a sealing assembly for use with a skylight that has a light transmitting section that is at least semi-transparent and is mounted in a frame. The light transmitting section has a bottom surface that is juxtaposed to the upper top surface of a curb when the skylight is mounted to the curb. The frame has an inner side surface that faces the outer surface of the curb when the skylight is mounted on the curb. A sealing gasket is also included and has a main body portion that contacts the upper top surface of the curb. The gasket also has an arm that extends from the main body portion and contacts the inner side surface of the frame.

The present invention also includes an exemplary embodiment of the sealing assembly as described above where the gasket has a second arm that extends from the main body portion and is in contact with the inner side surface of the frame or skylight. Additionally, the second arm may include a tip that is more flexible than the rest of the second arm.

Additionally, the present invention may include an exemplary embodiment where the gasket has a third and fourth arm that extend from the main body portion and contact the bottom surface of the skylight. Further, the third and fourth arms may be more flexible than the main body portion.

The present invention also provides for an exemplary embodiment of the sealing assembly as discussed above where the gasket has a fifth arm that extends from the main body portion and contacts the upper top surface of the curb. In other exemplary embodiments of the present invention, the gasket may have first and second fingers that extend therefrom in order to contact the upper top surface of the curb. The first and second fingers may be more flexible than the

rest of the fifth arm. Alternatively, the fifth arm may also include a third finger that extends in a direction opposite from the second finger. In this instance, the first and second fingers may be more flexible than the third finger and the main body portion.

In accordance with another exemplary embodiment of the present invention, the sealing assembly as discussed above may have a skylight that has a lip. In this instance, the second arm may contact the lip. Alternatively, the second arm may be affixed or fastened to the lip.

Also provided in accordance with the present invention is a sealing assembly as discussed above where certain portions of the gasket are more flexible than other portions of the gasket.

The present invention also provides for a sealing assembly for use with a skylight on a curb with an upper top surface and an outer surface. The skylight has a light transmitting section that is at least semi-transparent and attached to a frame. The skylight has a lip and an inner side surface that faces the outer surface of the curb to define a first gap. The skylight also has a bottom surface that faces the upper top surface of the curb to define a second gap. A gasket is disposed between the skylight and the curb. The gasket has a main body portion that contacts the upper top surface of the curb and the bottom surface of the skylight and extends across the second gap. The gasket has a first arm that extends from the main body portion and across the first gap and contacts the inner side surface of the skylight. The gasket also has a second arm with a tip that extends from the main body portion and across the first gap, the tip contacting the inner side surface of the skylight. Additionally, the gasket has third and fourth arms that extend from the main body portion and contact the bottom surface of the skylight. The gasket also has a fifth arm that extends from the main body portion, the fifth arm having a first, second, and third finger extending therefrom. The first and second fingers contact the upper top surface of the curb. In this exemplary embodiment of the present invention, the first arm, the tip of the second arm, the third arm, the fourth arm, the first finger, and the second finger is more flexible than the main body portion, the rest of the second arm, the third finger, and the rest of the fifth arm.

## Bri f Description of the Drawings

Fig. 1 is a perspective view of a skylight mounted on a roof in accordance with one exemplary embodiment of the present invention.

Fig. 2 is a perspective view of a gasket that may be used in accordance with one exemplary embodiment of the present invention.

Fig. 3 is a perspective view of a corner portion of a gasket as used in accordance with one exemplary embodiment of the present invention.

Fig. 4 is a perspective view of a corner portion of a skylight in accordance with one exemplary embodiment of the present invention.

Fig. 5 is a cross-sectional view taken along line 5-5 of Fig. 1. A sealing assembly used in accordance with one exemplary embodiment of the present invention is shown and has a gasket disposed between a curb and a skylight.

## Detailed Discussion of Preferred Embodiments

Reference will now be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, and not meant as a limitation of the invention. For example, features illustrated or described as part of one embodiment can be used with another embodiment to yield still a third embodiment. It is intended that the present invention include these and other modifications and variations.

Fig. 1 shows an exemplary embodiment of a skylight, generally 12, that may be used in accordance with the present invention. Skylight 12 is shown installed on a conventional roof, generally 58. Roof 58 may either be inclined or may be flat. Additionally, it is to be understood that roof 58 may be inclined at various angles. As such, the skylight 12 used in accordance with the present invention may be used on any type or configuration of roof 58. Fig. 1 also shows a plurality of shingles located on roof 58. Shingles 60, may abut a curb 14 at an outer surface 18 (Fig. 5) and may reside under a frame 22 of skylight 12.

For purposes of this disclosure, directional terms such as "upper" and "outer" will be used to denote directions relative to the normal orientation of the installed skylight 12. As such, these directional terms denote the directions with

respect to the center of the opening defined by a curb 14 (Fig. 5) installed on roof 58.

Fig. 5 shows the preferred embodiment of a sealing assembly, generally 10, in accordance with the present invention. Here, a gasket, generally 32, is present and is disposed between a curb 14 and skylight 12. Curb 14 is a structure that surrounds the opening in roof 58 (Fig. 1) and may either be mounted to roof 58 or to other structure located inside of the building to which skylight 12 is installed. Curb 14 is typically square shaped or rectangular shaped and may be formed with metal members or stock structural lumber. However, curb 14 may be of any shape or may be made of different materials in accordance with other exemplary embodiments of the present invention.

Although described as being used in connection with a fixed skylight 12, the sealing assembly 10 of the present invention may also be used with a ventilating skylight 12. Additionally, other types of skylights 12 may also be used in conjunction with the sealing assembly 10 of the present invention. Additionally, although shown as being used in conjunction with a rectangular or square shaped skylight 12 and curb 14, the sealing assembly 10 of the present invention may employ skylights 12 and curbs 14 taking a variety of shapes, for instance they may be in the shape of a pentagon, hexagon, octagon, or triangle in other exemplary embodiments of the present invention.

The skylight 12 shown in Fig. 5 has a pair of window panes 62, 64 incorporated therein. Panes 62, 64 may be of any degree of transparency and may be of any thickness. The arrangement of the pair of panes 62, 64 separated a certain distance is typically known in the art as an insulating window or insulating glass. Panes 62, 64 may be made of any semi-transparent or transparent material such as glass, plastic, various types of glazing materials, etc. As understood herein, panes 62, 64 are light transmitting, which will be appreciated to include transparent, translucent, semi-translucent, and all other degrees and extents of light transmittal therethrough. Although shown as having a pair of panes 62, 64 it is to be understood that in other exemplary embodiments of the present invention that only a single pane 62 may be employed. Further, more two panes 62, 64 may be used in other exemplary embodiments of the present invention.

As such, a light transmitting section, generally 20, of skylight 12 is provided with any number of panes 62, 64 that are of various degrees of transparency. Light transmitting section 20 of skylight 12 that includes panes 62, 64 is retained by a frame 22. Sealant, exemplified by a caulk 68, may be applied between frame 22 and light transmitting section 20 of skylight 12 in order to prevent wind, rain, heat, cold, etc. from entering and/or escaping the skylight 12. However, it is to be understood that in other exemplary embodiments of the present invention, that the use of caulk 68 is not needed, or that other mastics, glues, and the like may be used in place of caulk 68. It is also to be understood, however, that certain portions of light transmitting section 20 may not transmit light therethrough.

In order to prevent wind, rain, heat, and/or cold from being transferred into or out of the building, gasket 32 is incorporated into sealing assembly 10. Gasket 32 may be made of rubber, urethane, PVC, plastics, or other materials. Additionally, gasket 32 may be made of different materials that each exhibit different amounts of flexibility. In accordance with one exemplary embodiment of the present invention, gasket 32 is composed of two different types of rubber, one being more flexible than the other.

Frame 22 of skylight 12 includes an inner side surface 24 that faces an outer surface 18 of curb 14 when skylight 12 is mounted to curb 14. A first gap 26 is then defined between the inner side surface 24 of skylight 12 and the outer surface 18 of curb 14. Additionally, orientation of skylight 12 and curb 14 defines a second gap 30 to be formed between a bottom surface 28 of light transmitting section 20 and upper top surface 16 of curb 14. Bottom surface 28 is a portion of skylight 12 that faces upper top surface 16 of curb 14 in certain exemplary embodiments of the present invention. Wind, rain, heat, and/or cold may be transferred through the first gap 26 and the second gap 30 and hence into and/or out of the building to which the skylight 12 is installed. In one exemplary embodiment of the present invention, gasket 32 reduces this unwanted transfer through the first and second gaps 26, 30.

Gasket 32 includes a main body portion 34 that is positioned so as to reside within second gap 30. In one exemplary embodiment of the present invention, main body portion 34 contacts both the upper top surface 16 of curb 14 and bottom surface 28 of light transmitting section 20 of skylight 12. Main body portion 34 may

extend all the way across the second gap 30 such that the second gap 30 is effectively sealed at the location of main body portion 34. In this exemplary embodiment of the present invention, main body portion 34 of gasket 32 rests on top of curb 14 and extends across second gap 30 and into supporting contact with the bottom surface 28 of skylight 12. In another exemplary embodiment, the weight of skylight 12 is carried by main body portion 34.

A first arm 36 extends from main body portion 34 of gasket 32 with an outer end thereof making sealing contact with the inner side surface 24 of frame 22. The contact between the first arm 36 and inner side surface 24 may be either line contact or surface contact in accordance with various exemplary embodiments of the present invention. As such, although Fig. 5 only shows the outer end of the first arm 36 contacting the inner side surface 24, it is to be understood that in other exemplary embodiments of the present invention that a larger surface of first arm 36 may engage the inner side surface 24. First arm 36 extends across the first gap 26 from outer surface 18 of curb 14 to inner side surface 24 of skylight 12. Additionally, first arm 36 may contact the upper top surface 16 of curb 14 in various exemplary embodiments. However, in other exemplary embodiments of the present invention, first arm 36 may not contact the upper top surface 16 of curb 14. First arm 36 may therefore seal first gap 26 and prevent the transfer of wind, rain, heat, and/or cold through first gap 26.

Gasket 32 may also be provided with a second arm 38 that extends from main body portion 34 in accordance with one exemplary embodiment of the present invention. A tip 40 may be present on one end of second arm 38 and may contact the inner side surface 24. Contact between tip 40 and inner side surface 24 may be either line or surface contact in accordance with various exemplary embodiments of the present invention, and as discussed above with respect to first arm 36. Frame 22 may be provided with a lip 54 that is contacted by the second arm 38. Contact between second arm 38 and lip 54 may cause a further seal to be created in sealing assembly 10. As such, second arm 38 may form a seal at lip 54 and also at inner side surface 24. Lip 54 may be configured to incline downwardly away from light transmitting section 20 to drain moisture toward outer surface 18 of curb 14, thereby promoting the drainage of moisture from skylight 12. It will be

appreciated that second arm 38 also may be configured to provide a secondary weather-resistant seal in addition to caulk 68.

Main body portion 34 may also include a third arm 42 and a fourth arm 44 extending therefrom. The third and fourth arms 42, 44 may contact the bottom surface 28 of light transmitting section 20 of skylight 12. Contact between third and fourth arms 42, 44 and bottom surface 28 may be either line or surface contact as discussed above with respect to first arm 36. Third and fourth arms 42, 44 may therefore create another pair of seals present in sealing assembly 10. Third and fourth arms 42, 44 may help to prevent the transfer of wind, rain, heat, and/or cold through second gap 30. As shown in Fig. 5, third arm 42 extends from one side of main body portion 34 while fourth arm 44 extends from an opposite side of main body portion 34. It is to be understood that in other exemplary embodiments of the present invention, that third and fourth arms 42, 44 may extend from the same side of main body portion 34. In other exemplary embodiments, third arm 42 and fourth arm 44 may be biased in opposing directions, as shown in Fig. 5, thereby promoting the sealing of skylight 12 against both positive and negative pressure differentials between the exterior and interior of skylight 12.

Main body portion 34 may also be provided with a fifth arm 46 in accordance with another exemplary embodiment of the present invention. Fifth arm 46 may extend from main body portion 34 and may be located in second gap 30. Fifth arm 46 may contact upper top surface 16 of curb 14 in order to create an additional seal or seals in the sealing assembly 10. In the exemplary embodiment shown in Fig. 5, fifth arm 46 is provided with a first finger 48, a second finger 50, and a third finger 52. First finger 48 engages the upper top surface 16 of curb 14 in order to create a seal. This seal may be either formed through line or surface contact as discussed above with respect to first arm 36. Additionally, second finger 50 may also extend from fifth arm 46 and contact the upper top surface 16 of curb 14. Second finger 50 also may be dimensionally configured to allow a predetermined distance between the third finger 52 and bottom surface 28 sufficient for condensed moisture droplets upon bottom surface 28 to pass above second finger 50 without contact and thereby migrate to gap 30 for collection upon fifth arm 46.

In addition to creating seals, the first and second fingers 48, 50 of fifth arm 46 may also be used to help properly position and stabilize gasket 32. As such, the main body portion 34, first finger 48, and second finger 50 may help to locate gasket 32 within sealing assembly 10. Additionally, first arm 36, second arm 38, third arm 42, and fourth arm 44 may help locate/stabilize gasket 32 in the sealing assembly 10.

The fifth arm 46 of gasket 32 may also be provided with a third finger 52 that extends from one end of the fifth arm 46 in accordance with one exemplary embodiment of the present invention. Third finger 52 may be configured in order to create a gutter in cooperation with fifth arm 46, thereby trapping and retaining condensed, liquid moisture from drainage into the interior of a building upon which skylight 12 is installed.

As stated, certain portions of gasket 32 may be more flexible than other portions of gasket 32. This arrangement may be advantageous in that rigid portions of gasket 32 may allow gasket 32 to be properly positioned within sealing assembly 10 and prevent it from moving when subjected to forces, such as wind, that contact sealing assembly 10. Additionally, the flexible portions of gasket 32 may be advantageous in that these portions may flex and allow for proper contact with skylight 12, frame 22, and/or curb 14. This flexibility may therefore provide compensation for unevenness present when skylight 12 is mounted onto curb 14. Also, this flexibility may help ensure sealing assembly 10 properly functions when used with skylights 12 and curbs 14 that are of different sizes and shapes. In accordance with one exemplary embodiment of the present invention, first arm 36, tip 40, third arm 42, fourth arm 44, first finger 48, and second finger 50 may be more flexible than the rest of gasket 32 (main body portion 34, the rest of the second arm 38, the rest of the fifth arm 46, and third finger 52). The portions of gasket 32 that are more flexible than the other portions may be made of a more flexible material, or may be made of the same material that is treated in order to exhibit an increased amount of flexibility. Alternatively, the flexible portions may be made of a different material and may be connected to the less flexible portions through any means commonly known in the art. For instance, adhesives, sonic welding, or mechanical fasteners may be employed in accordance with various exemplary embodiments of the present invention. Additionally, gasket 32 may

have the same amount of flexibility throughout in different exemplary embodiments, and as such does not have portions that are of different flexibility. In certain exemplary embodiments of the present invention, varying flexibility may be realized by varying the thickness of the material constituting gasket 32.

Another view of a preferred embodiment of gasket 32 is shown in Fig. 2. Gasket 32 may be formed through extrusion or may be molded to a particular length, or may be cut down from a longer length in order to fit the application into which it is employed. Fig. 3 shows a corner configuration of gasket 32. Such corner configuration may be realized through adhesion, vulcanization, sonic welding, and/or mechanical fastening of interfacing sections of lengths of gasket 32.

Second arm 38 may be provided with one or more drainage openings 56 therethrough. Water that may accumulate in the sealing assembly 10 may be removed therefrom through drainage openings 56. As shown in Fig. 3, water that may accumulate in sealing assembly 10 may also drain therefrom through channel 53 in gasket 32. Channel 53 may be formed by removal of portions of main body portion 34, third arm 42, and fourth arm 44 from locations along gasket 32 at selected locations, including, for example as shown in Fig. 3, corner configurations. Channel 53 may also be advantageous in allowing the passage of condensed moisture upon fifth arm 46 to second arm 38, from which such condensed water may be drained exteriorly from skylight 12.

Referring back to Fig. 5, water that is transferred through second arm 38 may be subsequently moved into contact with first arm 36 and away from the interior of the building. The water may then be subsequently removed from sealing assembly 10 through any mechanism commonly known in the art. For instance, in accordance with one exemplary embodiment of the present invention, the water may be drained through an opening in first arm 36, or alternatively a gap may be present at a corner of gasket 32 such that first arm 36 is discontinuous at the corner. Still further, the water may accumulate on first arm 36 until it reaches a point where its weight causes it to be drained through the area of contact between first arm 36 and inner side surface 24.

Fig. 4 shows an exemplary embodiment of a corner section of frame 22 of skylight 12. A coupling retainer 66 is shown as being located over a corner of

frame 22. Coupling retainer 66 may also be used in order to help hold frame 22 together at the corner portions.

Referring to Fig. 5, frame 22 of skylight 12 may be attached to curb 14 by mechanical fasteners (not shown) as is commonly known in the art. For instance, one or more screws, nails, or rivets may be disposed through frame 22 at a location below first arm 36 for securement to curb 14. Additionally, other ways of attaching skylight 12 and curb 14 may be employed as is commonly known to those skilled in the art. In certain exemplary embodiments of the present invention, gasket 32 may be attached to frame 22 of skylight 12. For instance, second arm 38 of gasket 32 may be attached to lip 54 of frame 22 by a mechanical fastener such as a bolt, rivet, nail, or snap fastening. Alternatively, other portions of gasket 32 may be mechanically attached to curb 14 and/or skylight 12. Alternatively, gasket 32 may not be mechanically attached to these components, but may be retained therein through a compression engagement brought about by the weight of skylight 12 and/or the attachment of skylight 12 to curb 14.

It should be understood that the present invention includes various modifications that can be made to the exemplary embodiments of the sealing assembly 10 described herein as come within the scope of the appended claims and their equivalents.